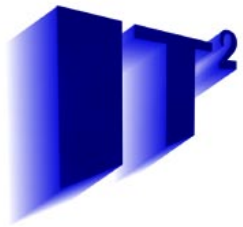


IT^2

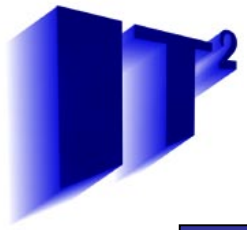
Information Technology for the Twenty-first Century

Briefing to the Hazards Workshop

by

Bill Turnbull, NOAA

July 13, 1999



An Investment in America's Future

- President Clinton and Vice President Gore propose a $366M increase in the Government's investment in IT R&D for the fiscal year 2000 budget
- IT^2 builds on the Government's previous accomplishments and current investments

Major IT^2 Investments

- IT^2 will increase Federal investments in:
  - Fundamental IT research
  - Advanced computing for science, engineering, and the Nation
  - Research in the social and economic implications of the Information Revolution, and support for the education and training of America's IT workforce
  - Enabling Technology Centers & Expedition Centers

Proposed FY2000 Budget

Agency	Fundamental Information Technology Research	Advanced Computing for Science, Engineering, and the Nation	Ethical, Legal, and Social Implications and Workforce Programs	Total
DOD	$100M	---	---	$100M
DOE	$ 6M	$ 62M	$ 2M	$ 70M
NASA	$ 18M	$ 19M	$ 1M	$ 38M
NIH	$ 2M	$ 2M	$ 2M	$ 6M
NOAA	$ 2M	$ 4M	---	$ 6M
NSF	$100M	$ 36M	$ 10M	$146M
Total	$228M	$123M	$ 15M	$366M

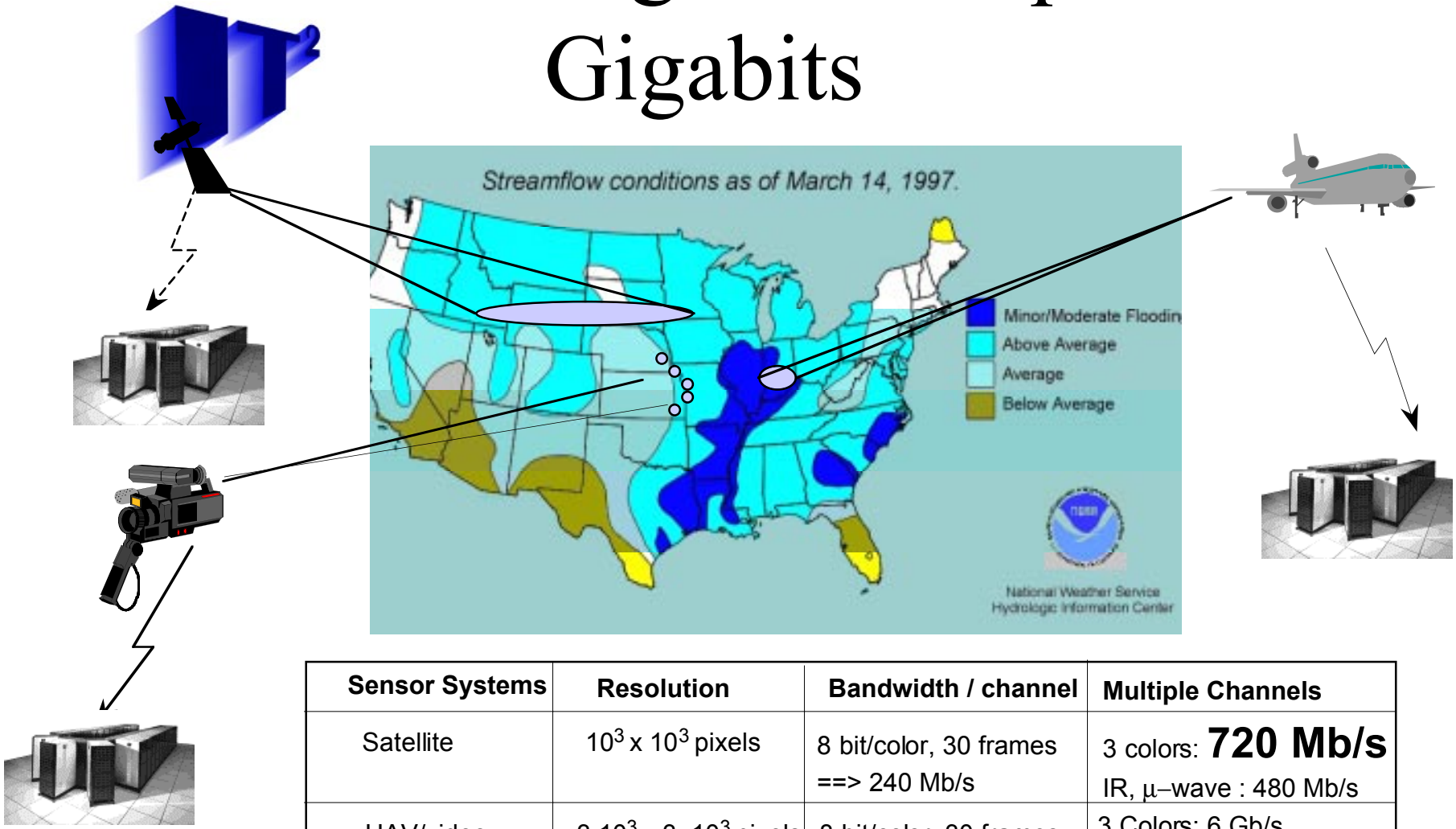
Fundamental IT Research: Software

- Highest IT R&D priority according to PITAC
  - The demand for software exceeds our ability to produce it
  - Today's software is fragile, unreliable, and difficult to design, test, maintain, and upgrade
- Proposed research areas:
  - Software engineering
  - End-user programming
  - Component-based software development
  - Active software
  - Autonomous software
  - High-assurance software

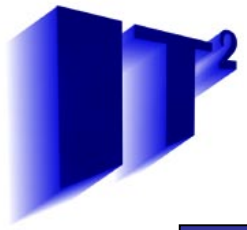
Fundamental IT Research: Scalable Information Infrastructure

- Research to support the phenomenal growth of the Internet
  - In 1985 the Internet connected 2,000 computers
  - Today it connects over 37 million computers
  - Future networks will connect at least a billion users and will be more complex - they will connect sensors, wireless modems, and embedded devices
- Proposed research areas:
  - Deeply networked systems
  - Anytime, anywhere connectivity
  - Network modeling and simulation

Crisis Management requires Gigabits



Sensor Systems	Resolution	Bandwidth / channel	Multiple Channels
Satellite	10^3 x 10^3 pixels	8 bit/color, 30 frames ==> 240 Mb/s	3 colors: **720 Mb/s** IR, μ–wave : 480 Mb/s
UAV/video	3.10^3 x $3.\ 10^3$ pixels	8 bit/color, 30 frames ==> 2 Gb/s	3 Colors: 6 Gb/s IR, μ–wave : **4 Gb/s**
radar	1 Ghz bandwidth	Nyquist, dynamic range ==> 20 Gb/s	**20 Gb/s**
Cellular	100 Mhz bandwidth	2 Gb/s	5 bands ==> **10 Gb/s**

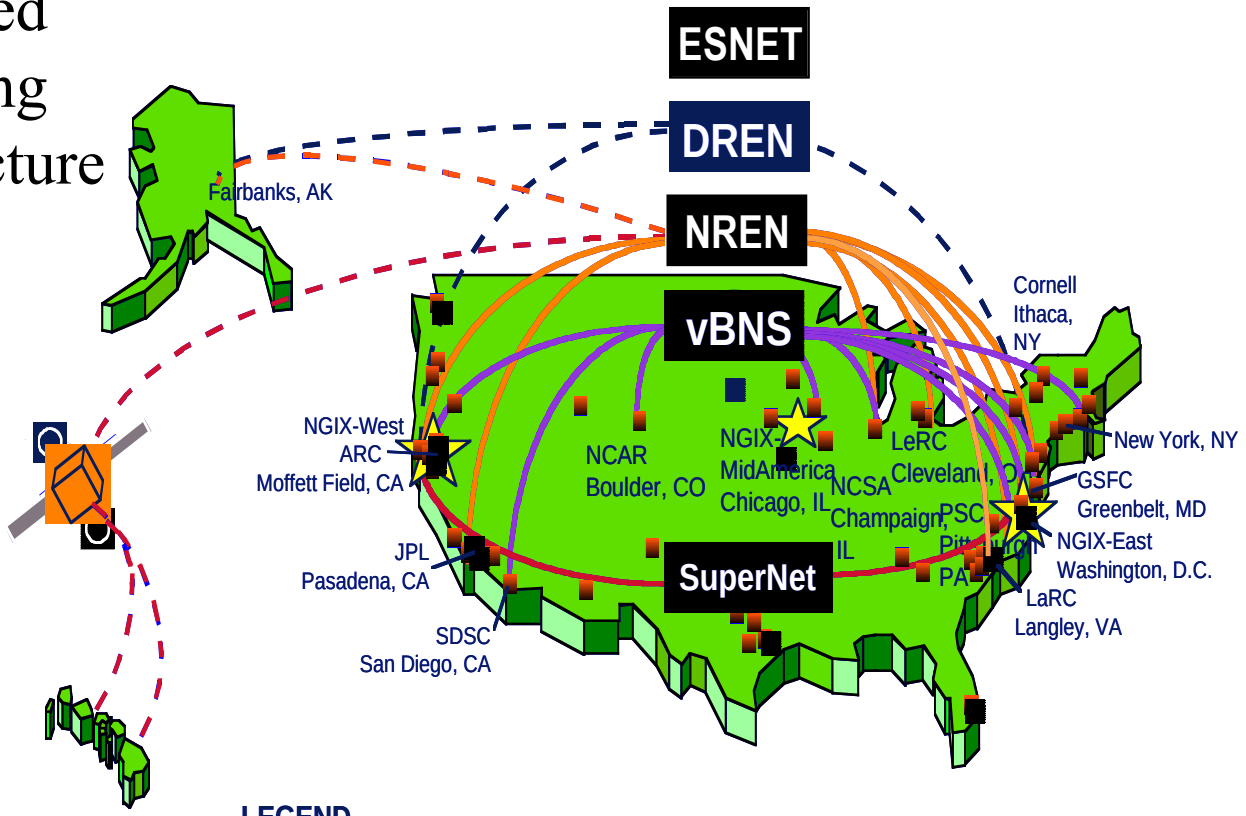


Fundamental IT Research: High-End Computing

- Leading-edge research for future generations of computing to:
  - Improve computational speed on applications
  - Increase the efficiency of massively parallel systems, with a focus on systems software
  - Develop technologies to enable future systems capable of a thousand trillion (10^{15}) calculations per second
- Proposed research areas:
  - Improved supercomputer performance and efficiency
  - Creation of a computational grid
  - Revolutionary computing

Distributed Computing Infrastructure

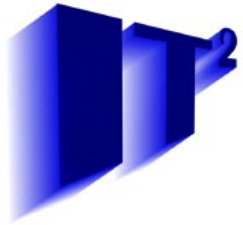
Next Generation Internet Architecture



LEGEND

DREN - Defense Research & Engineering Network
NREN - NASA Research and Education Network
vBNS - Very High Speed Backbone Network Service (NSF)
NOTE: vBNS will support initial Internet 2 community
SuperNet - Terabit Research Network (DARPA)

- NREN Application Partner
- vBNS Partner
- Next Generation Internet Exchange

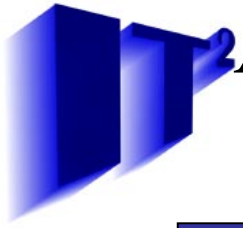


Fundamental IT Research: Human Computer Interaction and Information Management

- Research to improve the ways we interact with computers
  - Computers are still too hard to use; computer users waste over 12 percent of their time because they can't understand what their computers are doing
  - Improved accessibility for people without a keyboard and persons with disabilities
  - Better techniques for locating data and extracting "knowledge"
- Proposed research areas:
  - Computers that speak, listen, and understand human language
  - Information visualization

Stretching the technology

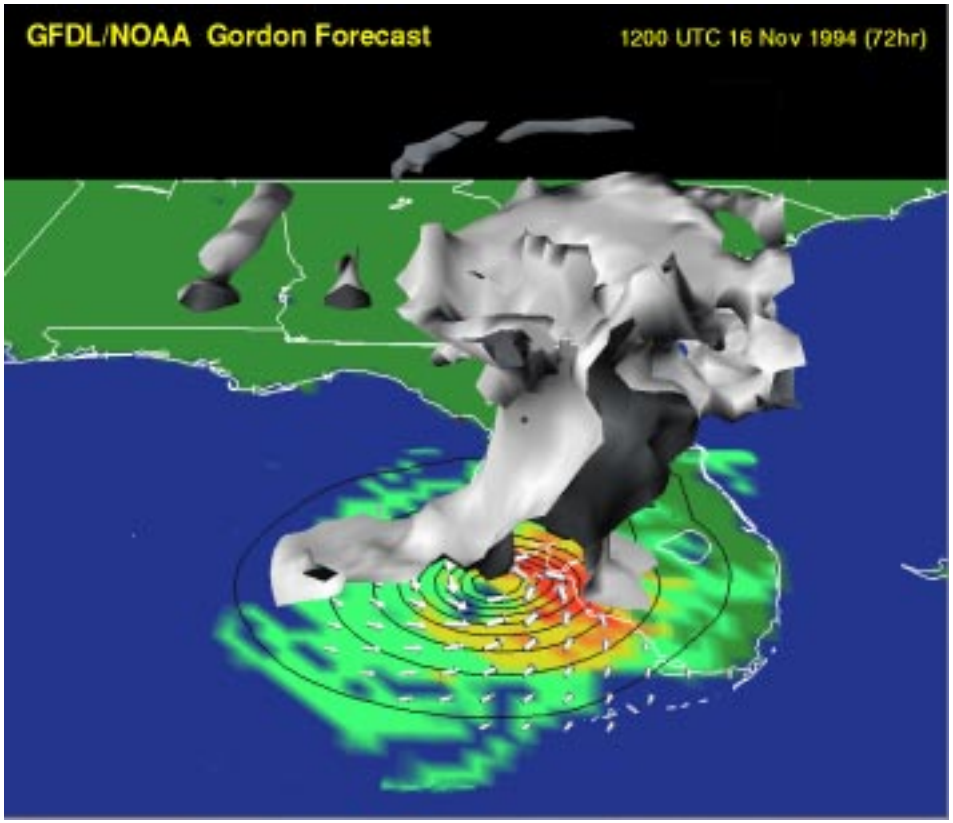
- Evaluate an advanced mobile emergency response for marine oil spills

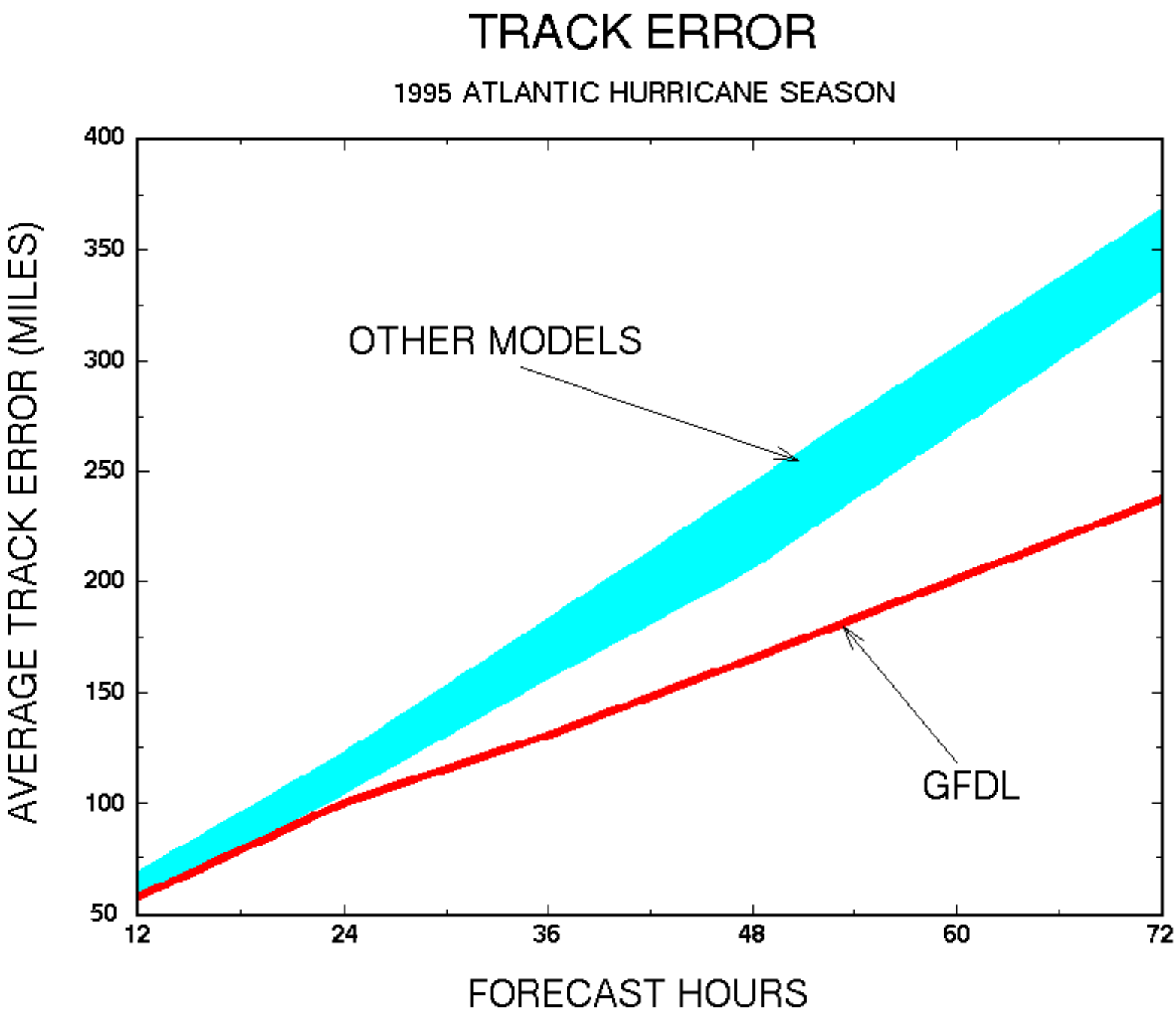


Advanced Computing for Science, Engineering, and the Nation

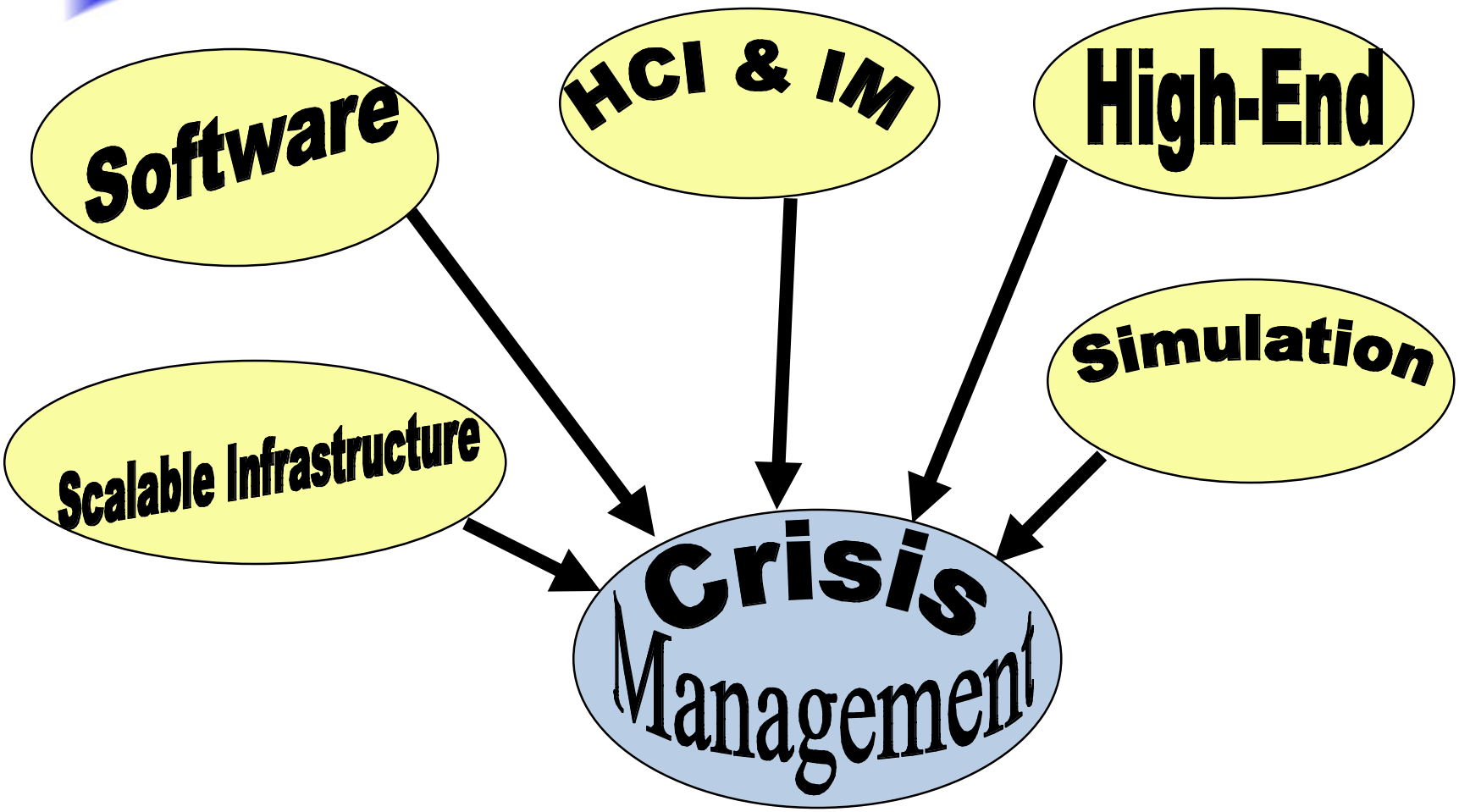
- Establish and fund multidisciplinary teams working on our most challenging problems, including:
  - Disaster prediction and mitigation
  - Predicting climate change
  - Predicting severe weather
  - Understanding genetic function
  - Computational seismology
  - Simulating combustion
  - Simulating materials
  - Simulating complex vehicles and missions

Simulation and Forecasting




TRACK ERROR
1995 ATLANTIC HURRICANE SEASON
AVERAGE TRACK ERROR (MILES)
400
350
300
250
200
150
100
50
OTHER MODELS
GFDL
12
24
36
48
60
72
FORECAST HOURS

Enabling Technology Center for Crisis Management



For More Information

- www.ccic.gov
- www.ngi.gov